Summary of "The Effects of Community-Acquired Pneumonia During Pregnancy Ending With a Live Birth"

By Y. Jin, K.C. Carriere , T.J. Marrie, G. Predy, C. Houston, K. Ness, and D. Johnson

Purpose

Current medical practice is to admit most pregnant females with community-acquired pneumonia into hospital. This study analyzed the outcomes for community-acquired pneumonia during a pregnancy ending with a live birth.

Approach

Alberta hospital abstracts and vital statistics data were used between April 1, 1994 to March 31, 1999.

Key findings

The following are the key findings of this study:

- Three hundred and thirty five (335) pregnant women were identified who were admitted to hospital for community-acquired pneumonia during pregnancy.
- New cases of hospitalization for community-acquired pneumonia were about 1.50 per 1,000 pregnancies in mothers eighteen years and over, compared to about 1.47 new cases per 1,000 females (eighteen to forty-nine years) in the general population.
- The hospital length of stay for pneumonia during pregnancy was shorter compared to the hospital length of stay for non-pregnant women with pneumonia.
- The hospital length of stay during the subsequent newborn delivery was longer for mothers with a previous hospitalization for community-acquired pneumonia compared to mothers without a previous hospitalization for pneumonia.
- The risk of a small for gestational age newborn was eighty-six percent greater for mothers with a past hospitalization for community-acquired pneumonia compared to mothers without a past hospitalization for community-acquired pneumonia.
- No other outcomes for community-acquired pneumonia (i.e. daily cost, hospital death, death within one year and hospital re-admission within thirty days) were significantly associated with pregnancy.
- No other outcomes for pregnancy (i.e. pre-term newborns, low birth weight newborns) were significantly associated with pneumonia.

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Conclusions

Pregnancy is not a significant risk factor for community-acquired pneumonia. Community-acquired pneumonia, during most pregnancies ending with a live birth, appears to be well tolerated by mothers and newborns.

For more information

Copies of the report are available from the

Alberta Centre for Health Services Utilization Research

- by contacting David Johnson by e-mail at cujecjohnson@shaw.ca
- at http://www.health.gov.ab.ca/system/key/Research/achsur_reports.html

Alberta Centre for Health Services Utilization Research

The Alberta Centre for Health Services Utilization Research is a joint initiative between the University of Alberta and the University of Calgary, funded by Alberta Health and Wellness. The Centre conducts studies of how health services are used and delivered to inform health policy development and management of health services delivery.

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August, 2003

THE EFFECTS OF COMMUNITY-ACQUIRED PNEUMONIA DURING PREGNANCY ENDING WITH A LIVE BIRTH

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Alberta Centre for Health Services Utilization Research

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SUMMARY

We analyzed the incidence and outcomes for community-acquired pneumonia during a pregnancy ending with a live birth in the province of Alberta, Canada. We used hospital abstracts and vital statistics data between April 1, 1994 to March 31, 1999. The incidence of hospitalization for community-acquired pneumonia during pregnancy (three hundred and thirty-five women during the study period) was similar to that of women of the same age ranges for the general Alberta population. Outcomes for community-acquired pneumonia (length of hospital stay, costs, mortality, and hospital readmission) and pregnancy (maternal length of stay, small for dates newborn, prematurity, and low birth weight) were compared to a group of matched controls. The relative risk of staying longer at hospital for pneumonia was 0.44 during pregnancy compared to non-pregnant mothers with pneumonia. The relative risk of staying longer at hospital during delivery was 1.88, higher in those with a past hospitalization for community-acquired pneumonia. The relative risk of a small for gestational age newborn was 1.86 for those with a past hospitalization for community-acquired pneumonia compared to those without. Community-acquired pneumonia during most pregnancies ending with a live birth appears to be well tolerated by mothers and newborns.

INTRODUCTION

The attack rate of community-acquired pneumonia during pregnancy is thought to be similar to the population at large but with greater virulence in terms of maternal and fetal outcomes [1]. Current medical practice is to admit most pregnant females with community-acquired pneumonia into hospital [2]. Despite hospitalization, increased newborn mortality [3], prematurity [2], and small for gestational age [2, 4] are associated with community-acquired pneumonia during a pregnancy ending with a live birth. The existing literature describing community-acquired pneumonia during pregnancy is limited. In this study, we calculate the attack rate for community-acquired pneumonia during a pregnancy ending with a birth for the general female population in the province of Alberta, Canada. In order to analyze pregnancy outcomes, we compare all pregnancies ending in a birth who were also hospitalized with community-acquired pneumonia during the pregnancy to an age matched control group without pneumonia. In order to analyze pneumonia outcomes, we compare all pregnancies ending in a birth who were also hospitalized with community-acquired pneumonia during the pregnancy to an age matched control group who were not pregnant. Outcomes for community-acquired pneumonia (length of hospital stay, costs, mortality, and hospital readmission) and pregnancy (maternal length of stay, small for gestational age newborn, prematurity, and low birth weight) are described.

METHODS

Three administrative health service databases maintained by Alberta Health and Wellness were used:

1. Canadian Institute for Health Information's (CIHI) Inpatient Discharge Abstract Database (DAD) for the province of Alberta for fiscal years 1994/1995 to 1998/1999,
2. Alberta Vital Statistics Birth Database for calendar years 1997 to 1999, and
3. Alberta Health Insurance Plan Registry File for fiscal years 1994/1995 to 1999/2000.

Identifying Maternal Deliveries:

Maternal deliveries were identified using CIHI (Canadian Institute for Health Information) DAD (Discharge Abstract Database). Over ninety-nine percent of the births that occur in Alberta every year take place in acute care facilities. All separations with a Main Patient Service (MPS) area of 51 (coding for obstetrics delivered) were extracted. To obtain newborn data, MPS field of 54 (coding for newborn) was extracted from CIHI DAD. Stillbirths are not included in the MPS field of 54. The Alberta Health Care Insurance Plan (AHCIP) registry file group number was used to match each newborn to its mother and determine multiple births. Cesarean section (ICD-9-CM procedure 74.xx), hypertension complicating pregnancy or childbirth (ICD-9-CM 642.xx) and diabetes (ICD-9-CM 648.0, 648.8) comorbidity were extracted from the delivery separation. Maternal deliveries were linked to Alberta vital statistic birth records which contain responses to questions completed by the physician attending birth and the mother. Because the vital statistic database does not record patients unique Alberta Health Insurance Registry number, a deterministic linkage to maternal records for each year was done by using: newborn birth date, birth weight, delivery site (eighty-seven facilities), newborn's sex, and maternal age). Variables unique to vital statistics include weeks of gestation, history of smoking, consumption of alcohol, use of illicit drugs during the current pregnancy, physician determination of small for gestational age, and Apgar score at five minutes.

Identifying Pneumonia:

Community-acquired pneumonia was defined as the most responsible diagnosis (MRD) or any of the other fifteen diagnosis codes defined to be Type 1 (pre-admit comorbidity) with the ICD-9-CM values of 480.x to 487.x (pneumonia) or 507.x (aspiration pneumonia) excluding 484.x (pneumonia of infectious diseases classified elsewhere) [5, 6] in the CIHI DAD hospital abstracts.

Exclusion Criteria:

1. Not an Alberta resident or not treated in an Alberta acute care facility,
2. Adjacent diagnosis related group (ADRG) defining hospitalization for a surgical procedure, and
3. Any previous hospitalization within ten days of incident pneumonia case.

Charlson's comorbidity index was calculated using established definitions [7, 8] during the pneumonia hospitalization. Length of stay was calculated as days between discharge and admission date. Transfers were attributed to the index admission and cumulative hospital length of stay calculated. Transfer from another acute care facility was defined by readmission to hospital for the diagnosis of pneumonia within two days of previous discharge. All active hospital acute care beds in each year per resident region were surveyed and maintained in the provincial databases. Export was primary admission to a hospital, not within region of residence.

Severity of Community-Acquired Pneumonia, Defined:

1. Transfer from another acute care facility as defined by readmission to hospital for the diagnosis of pneumonia within forty eight hours of previous discharge,
2. Special care unit admission (defined by each hospital),
3. Diagnosis code of respiratory failure or arrest (ICD-9-CM 518.81, 799.1),
4. Diagnosis code of hypotension or shock (ICD-9-CM 458.xx, 785.5x),
5. Procedure code for ventilation greater than 96 hours (ICD-9-CM 96.72), and
6. Procedure code for dialysis (ICD-9-CM 39.95, 54.98)

Linking Pneumonia and Delivery:

Maternal delivery was linked to hospital separation for community-acquired pneumonia so that hospital admission for community-acquired pneumonia occurred no more than forty-four weeks before the delivery date in those with prolonged pregnancy (ICD-9-CM 645), thirty-seven weeks in those with premature labor (ICD-9-CM 644.2), and forty-two weeks in all others. When available, exact gestational timing was calculated in a subset of patients by subtracting the estimated date of conception (weeks of gestation before delivery date) and the date of hospital admission for community-acquired pneumonia.

Creating Comparison Groups:

Pregnant women with community-acquired pneumonia were matched by age and year to women with community-acquired pneumonia but not pregnant in order to assess the outcomes of the pneumonia. Similarly, pregnant women (singleton deliveries only) with community-acquired pneumonia were matched by age and year to women without community-acquired pneumonia but pregnant in order to assess the outcomes of the pregnancy. We used four controls for each case.

Defining Hospital Volume:

At the time of this study, all hospitals in Alberta are administered by an autonomous regional board in each of the seventeen health regions. All residents of Alberta enrolled in the public health care insurance plan reside in one of the seventeen health regions. Hospitals admitting patients with community-acquired pneumonia were categorized into five groups on the basis of the average number of separations per year between April 1, 1994 until March 31, 1999, geographic location, and medical school proximity:

Rural

- Less than fifty cases per year comprising seventy-seven hospitals;
- Fifty to 108 cases per year comprising twenty-seven hospitals;

The rural hospital cut-off values for pneumonia cases of 50 and 108 represented the 50^{th} and 75^{th} percentiles of the volume of pneumonia cases in all Alberta patients.

Regional

- Five hospitals located in one of the five non-metropolitan regional health care cities ranging from 67 to 251 cases per year and one high volume rural hospital accounting for 221 cases per year;

Metropolitan

- Seven hospitals located in the metropolitan health regions of Calgary and Capital hospitals ranging from 92 to 813 cases per year;
- Two hospitals located adjacent to medical schools with one hospital in each of two metropolitan centres ranging from 493 and 610 cases per year.

Hospital Costs:

Inpatient costing per resource group number (RGN) was calculated using the provincially approved methodology as set forth by the Provincial Costing Project and in accordance with the Provincial and National Management Information Systems guidelines [9, 10]. Total costs combine allocation and assignment of all direct and indirect costs associated with an inpatient encounter from the time a patient is admitted to the hospital to the time they are discharged. All costs were estimated in 1998/1999 and assumed similar for all the study years. The quality of the data reporting of costs in Alberta has been highly ranked by the Canadian Institutes for Health Information [11]. As such, the methodological issues that arise around collection of cost data in the United States of America [12], in part due to the use of prices rather than costs, and for centres in Canada which cost admissions

on the basis of "case-mix grouping", do not arise with the majority of the cost data considered in this analysis.

Mortality:

Vital statistics declaration of death certificates were merged with the Alberta Health Care Premium Registry databank in order to determine de-registration from the plan. Reliability of linkage was high (99.5 percent) as verified by comparing in-hospital deaths recorded by hospital chart extraction to Alberta Health Care Premium Registry death derived from vital statistics.

Outcomes Used in Regressions:

Community-Acquired Pneumonia Separation

- hospital length of stay (longer or shorter than the median of three days),
- daily hospital cost (higher or less than the median of $722.71),
- one-year mortality per separation (excluding in hospital deaths), and
- thirty-day all cause hospital readmission (excluding those for delivery).

Delivery Separation

- hospital length of stay (longer or shorter than the median of two days),
- daily hospital cost (higher or less than the median of $731.53),
- premature delivery (less than thirty-seven weeks),
- small for gestational age, and
- birth weight less than 2,500 grams.

STATISTICS

Crude separation rate and confidence intervals for community-acquired pneumonia during pregnancy was calculated from April 1, 1994 to March 31, 1999 using the denominator of all pregnancies during this period of time. Crude separation rate for community-acquired pneumonia in all females between the ages of eighteen and forty-nine (the age range for all pregnancies during the four study years) was calculated from April 1, 1994 to March 31, 1999 and female population between the ages of eighteen to forty-nine. Age at the fiscal year-end is used for the rates.

To analyze the case-control data, we used conditional logistic analysis tool, LogXact V. 2.0 by Cytel Software Corporation. Due to extreme sparseness of the data in many of the covariates, we combined several variables creating a new one. In particular, we combined hospital transfer, diagnosis code of respiratory failure / arrest, diagnosis code of hypotension / shock, procedure code for ventilation greater than ninety-six hours, procedure code for dialysis into a new variable named "severity of illness measure". Covariates for pneumonia outcomes used were pregnancy status, exported case (i.e. service region not equal to recipient region), urban or non-urban resident region, special / intensive care unit admission, and number of comorbid diagnosis (0, 1, 2, > 2). Similarly, covariates for pregnancy considered were pneumonia status, urban or non-urban resident region, exported case (i.e. service region not equal to recipient region), delivery by Cesarean section, trimester of pregnancy pneumonia occurred, smoking, use of alcohol and street drugs, status of maternal hypertension and diabetes. The unit of analysis was hospital separation with some patients being hospitalized on multiple occasions per year. In previous work, attempting to adjust for correlations in separations within the same subject did not result in substantial difference from those under the assumption of zero correlation. Therefore, we report results of a standard conditional logistic model [14, 15].

RESULTS

We identified three hundred and thirty-five pregnant women (Table 1) who were admitted to hospital for community-acquired pneumonia during pregnancy in the province of Alberta from April 1, 1994 to March 31, 1999. We found the incidence of community-acquired pneumonia during a pregnancy for mothers eighteen years and over ending with a viable birth (n = 335) to be 1.51 (95 percent CI 1.35 to 1.67) per one thousand pregnancies (total of 22,109 pregnancies during the study period). The incidence of community-acquired pneumonia (n = 5,093) for females (eighteen to forty-nine years) in the Alberta general population during the study period was 1.47 (95 percent CI 1.42 to 1.51) per one thousand.

The three hundred and thirty-five pregnant women who were admitted to hospital for community-acquired pneumonia were matched to a group of women (n = 1,340) also admitted to hospital for community-acquired pneumonia but not pregnant. Women hospitalized with community-acquired pneumonia during pregnancy had a mean age of twenty-seven years, about one-third resided in an urban region (less than their matched controls), had a median length of hospital stay one day less, and hospital cost $1,000 less than their matched controls. The diagnosis of pneumonia was infrequently made by chest radiograph, as only one of the three hundred and thirty-five pregnant women had an out-of-hospital chest x-ray in the two weeks prior to hospital admission (data derived from physician claims). There was no maternal mortality in the three hundred and thirty-five pregnant women cohort, which was less than the matched controls. After adjusting for other factors (described in statistical section), pregnancy was found related only to the length of hospital stay; the relative risk of a hospital length of stay for community-acquired pneumonia greater than the median (three days) was 0.49 (95 percent CI 0.34 - 0.59) in women hospitalized with community-acquired pneumonia during the course of pregnancy compared to their matched controls (Table 3). After adjusting for other factors, no other outcomes (i.e. daily cost, hospital death, death within one year and readmissions in thirty days) were significantly associated with pregnancy.

We obtained additional information about the course of pregnancy in one hundred and fifteen women hospitalized with community-acquired pneumonia. Not all of the original three hundred and thirty-five women were matched, as vital statistics data were unavailable for one hundred and ninety-seven women in earlier years and a deterministic match to vital statistics could not be made for twenty-three of them. The characteristics of the one hundred and fifteen women subset identified was similar to that of the three hundred and thirty-five pregnant women with pneumonia cohort in terms of median age and percent urban residence. Women, hospitalized with community-acquired pneumonia during the course of pregnancy, had a higher

prevalence of maternal hypertension and similar prevalence of maternal diabetes, gestation less than thirty-seven weeks, Cesarean section rate, and illicit drug use, compared to matched pregnant controls not hospitalized for community-acquired pneumonia. The timing of hospitalizations for pneumonia was almost evenly distributed throughout pregnancy. Women hospitalized with community-acquired pneumonia during the course of pregnancy had a longer average length of hospital stay during delivery and small for gestational age newborns compared to matched pregnant controls not hospitalized for community-acquired pneumonia. After adjusting for other factors (described in statistical section), pneumonia at delivery was related only to the length of hospital stay and small for gestational age; the relative risk of longer median (greater than two days) length of hospital stay during delivery was 1.88 (95 percent CI 1.15 - 3.09) in women hospitalized with community-acquired pneumonia during the course of pregnancy compared to their matched controls (Table 4). The relative risk of small-for-dates newborns was 1.86 (95 percent CI 1.01 - 3.45) in women hospitalized with community-acquired pneumonia, during the course of pregnancy, compared to their matched controls. No other outcomes were found significantly associated with pneumonia (i.e. pre-term newborns or low birth weight newborns).

DISCUSSION

The incidence of pneumonia during pregnancy quoted in the literature varies between 1 per 118 to 1 per 2,288 deliveries [15]. However these data are from hospital based case series which are fragmented and describe only a fraction of any given population [2-4]. We found the incidence of community-acquired pneumonia during a pregnancy ending with a viable birth to be 1.51 per one thousand deliveries in the province of Alberta. This estimated incidence rate (1 per 662 deliveries) is closer to the lower range quoted in the literature. The incidence of community-acquired pneumonia for females (eighteen to forty-nine years) in the Alberta general population during the study period was 1.47 per one thousand. To our knowledge this is the first population based estimate of incidence of pneumonia during pregnancy that suggests pregnancy is not a significant risk factor for community-acquired pneumonia.

The onset of pneumonia can be anytime during pregnancy with a mean around thirty-two gestational weeks [16]. In this study, we found that most hospitalizations for community-acquired pneumonia occurred relatively evenly throughout gestation. Some investigators have found that pre-term labor is more likely [17], in general, and especially if pneumonia occurs between the twentieth and thirty-sixth week [18]. Newborns of mothers who were hospitalized for community-acquired pneumonia during the course of pregnancy were small for gestational age and had a mean birth weight four hundred grams less in those without pneumonia during the pregnancy [4]. In this current study, we did not find that either prematurity nor birth weight differed for pregnancy with or without a community-acquired pneumonia hospitalization during the course of pregnancy. However, newborns of mothers who were hospitalized for community-acquired pneumonia during the course of pregnancy had an eighty-six percent greater chance of being small for gestational age. The discrepancy between birth weight and small for gestational age may be explained by the observation that small for gestational age accounts for only a small fraction of all births (14.8 and 7.8 percent, respectively). Death related to infection during pregnancy is infrequent (0.6 per 100,000 live births) [19] and high case fatality rates stem from data that predates modern antibiotics [20]. There were no newborn or maternal deaths in this study cohort. Street drug use [4] and smoking [21] are associated with increased incidence of pneumonia and self reports of both of these behaviors was higher in the group that was hospitalized with community-acquired pneumonia during the course of pregnancy.

The course of pneumonia may also be affected by the pregnancy. We found that the length of stay for the pneumonia was significantly shorter in those hospitalized with community-acquired pneumonia during the course of pregnancy. The crude mortality rate was less but not significantly different in those hospitalized with

community-acquired pneumonia during the course of pregnancy compared to matched controls. The threshold of hospital admission for community-acquired pneumonia during the course of pregnancy may be lower than for those not pregnant.

Our study included only pregnancies that ended with a viable birth. Stillbirth and abortions are not captured in these analyses and would be considered another important complication of community-acquired pneumonia. We had no absolute marker for date of conception, so that gestation time was used. This method may have overestimated those with community-acquired pneumonia during the course of pregnancy especially in the earlier gestational period. Population-based administrative database research is highly generalizable although limited in clinical details. We attempted to adjust for case severity (hypotension / shock, respiratory arrest / failure, ventilation, special care unit admission, export to another region, transfer to another hospital) and case mix (comorbidity, transfer from continuing care, age, sex) but may not have captured all variation [22]. These variables are likely less reliable than a clinically derived pneumonia index [23]

In conclusion, we found that the incidence of hospitalization for community-acquired pneumonia during pregnancy was similar to that of women of the same age ranges for the general Alberta population. The course of pneumonia during pregnancy was marked by a shorter length of hospital stay. The course of the delivery was marked by a longer length of hospital stay and small for gestational age newborn. Community-acquired pneumonia during most pregnancies ending with a viable birth are well tolerated by mother and newborn.

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Table 1 – Patient Characteristics of Pregnant and Non-Pregnant Women Hospitalized for Community-Acquired Pneumonia in Alberta During 1994/1995 to 1998/1999

	Community-Acquired Pneumonia During Pregnancy n = 335	Community-Acquired Pneumonia Without Pregnancy [1] n = 1,340
Unique persons; n	333	1,284
Age (mean and standard deviation in years)	26.9 (5.5)	28.6 (5.8)
Urban region of residence; n (%)	101 (30.1%)	471 (35.1%)
Urban region of service; n (%)	105 (31.3%)	500 (37.3%)
Mean (standard deviation) number of comorbidities	0.13 (0.35)	0.27 (0.53)
Mean (standard deviation) use of special medical care	0.04 (0.19)	0.12 (0.45)
Mean (median) length of stay in days	2.9 (2)	4.8 (3)
Thirty-day readmissions [2]; n (%)	36 (10.7%)	125 (9.5%)
One-year mortality of Alberta residents [3]; n (%)	0 (0%)	54 (4.0%)
Average daily hospital costs (dollars)	$673	$702
Average hospital costs per separation (dollars)	$1,921	$3,341

[1] Comparative group in matched for age, sex, and year of pneumonia
[2] Excluding pneumonia separations ending in deaths (denominator) and readmissions related to delivery (numerator)
[3] Excluding patients not in the Alberta Health Care registry for the one year follow up period

Table 2 – Patient Characteristics of Pregnant Women Hospitalized for Community-Acquired Pneumonia in Alberta During 1997/1998 to 1998/1999

	Pregnancy With Community-Acquired Pneumonia n = 115	Pregnancy Without Community-Acquired Pneumonia [1] n = 460
Age (mean in years)	27.14	28.27
Urban region of residence; n (%)	29 (25.2%)	254 (55.2%)
Urban region of service; n (%)	40 (34.8%)	289 (62.8%)
Maternal hypertension; n (%)	8 (7.0%)	16 (3.5%)
Maternal diabetes; n (%)	5 (4.3%)	14 (3.0%)
Pneumonia in first 14 weeks of pregnancy; n (%)	41 (35.7%)	Not applicable
Pneumonia in weeks 15 to 28 of pregnancy; n (%)	42 (36.5%)	Not applicable
Pneumonia in weeks 29 to 42 of pregnancy; n (%)	32 (27.8%)	Not applicable
All gestations less than 37 weeks; n (%)	7 (6.1%)	30 (6.5)
Cesarean section; n (%)	19 (16.5%)	69 (15.0%)
Past or present smoker [2]; n (%)	40 (34.8%)	124 (27.0%)
Consumption of alcohol during pregnancy [2]; n (%)	3 (2.6%)	20 (4.3%)
Use of street drugs during pregnancy [2]; n (%)	2 (1.7%)	6 (1.3%)
Mean (median) length of stay in days	2.77 (2)	2.21 (2)
Birth weight (grams)	3,378	3,340
Small for dates; n (%)	17 (14.8%)	36 (7.8%)
Apgar at five minutes less than seven; n (%)	2 (2.4%)	9 (2.3%)
Average hospital costs per separation (dollars)	$1,862	$1,832
Average hospital daily costs (dollars)	$671	$829

[1] Comparative group in matched for age
[2] Assuming no response to question is interpreted as no

Table 3 – Conditional Logistic Regression Analyses For Outcome of Community-Acquired Pneumonia in Pregnant Women Compared to Controls

	Hospital length of stay (longer than the median of three days)	Daily hospital cost (higher than the median of $722.71)	One-year mortality per separation (excluding in hospital deaths)	Thirty-day hospital readmission (excluding those for delivery)
Pregnancy	0.45 (0.34-0.59)	Not significant	Not significant	Not significant
Severity of illness measure	7.30 (3.05-17.47)	Not significant	32.72 (6.43-166.57)	2.84 (1.31-6.14)
Special care unit admission	1.96 (1.03-3.71)	37.45 (3.71-375.59)	Not significant	Not significant
Comorbidity (1) versus (0)	1.16 (0.87-1.56)	5.56 (1.21-25.48)	3.71 (1.68-8.15)	Not significant
Comorbidity (> 1) versus (0)	2.58 (0.99-6.730	17.23 (0.87-340.53)	10.99 (2.46-49.00)	Not significant
Urban residence	1.98 (1.54-2.54)	Not significant	2.95 (1.34-6.52)	Not significant

Note: In the model for average cost , none of the covariates were significant at 0.05 level

Table 4 – Conditional Logistic Regression Analyses for Outcome of Pregnancy in Women Hospitalized With Community-Acquired Pneumonia Compared to Controls

	Hospital length of stay (longer than the median of three days)	Daily hospital cost (higher than the median of $722.71)	Pre-term delivery (less than 37 weeks)	Small for gestational age	Birth weight less than 2,500 grams
Pneumonia	1.88 (1.15-3.09)	Not significant	Not significant	1.863 (1.005-3.454)	Not significant
Urban Residence	0.46 0.28-0.76	1.893 1.308-2.738	Not significant	Not significant	Not significant
Cesarean Section	45.21 (15.95-128.17)	1.67 (0.99-2.80)	Not significant	Not significant	3.64 (1.30-10.19)
Smoker	Not significant	Not significant	Not significant	2.15 (1.13-4.08)	2.78 (1.01-7.61)
Drug or Alcohol Use	Not significant	Not significant	3.67 (0.95-14.12)	Not significant	Not significant

Note: In the model for Apgar scores less than 7, none of the covariates were significant at 0.05 level.

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